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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/583,530	05/30/2007	Xiaodong Li	612408001US1	4960

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PERKINS COIE LLP
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER	
SARWAR, BABAR	
ART UNIT	**PAPER NUMBER**
2617	

NOTIFICATION DATE	DELIVERY MODE
10/27/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com

Office Action Summary	Application No.	Applicant(s)	
	10/583,530	LI ET AL.	
	Examiner	Art Unit	
	BABAR SARWAR	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 9-30* is/are rejected.

7)☒ Claim(s) *3-8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. No Information Disclosure Statement has been filed.

Claim Rejections - 35 USC § 101

2. Claims 13, 26 are process claims. They have been evaluated by the examiner and deemed statutory because the process is sufficiently tied to an apparatus.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: **"Method and Apparatus for Mitigating Pilot Signal Degradation by Employing Cell-Specific Pilot Subcarrier and Common Pilot Subcarrier Techniques in a Multi-Carrier Cellular Network"**

Claim Objections

4. Claim 1 is objected to because of the following informalities:

There is a typo i.e., "." in line 7 of the claim. The examiner suggests deleting it.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 9-11, 13-14, 16, 18, 21-26, 28-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Ma (US Pat. No.: 7,738,437 B2).

As per claims 1, 13, 23, 26 and 30, Ma teaches a method of mitigating pilot signal degradation in a multi-carrier wireless communication network of cells, base stations, and mobile stations (See Ma e.g., the communication signal i.e., an OFDM signal / the access channel information with common synchronization code and cell-specific synchronization code of Col. 2:14-18, Col. 2:25-26, Figs. 1, 8-9), the method comprising: generating cell-specific pilot subcarriers at the base station (See Ma e.g., modulation of the cell-specific synchronization code uniquely associated with a BTS onto a pilot channel, the predetermined pilot channel sub-carriers of the communication signal i.e., an OFDM signal of Col. 3:19-24), for performing network operations (See Ma e.g., the access operations i.e., the communication terminal extracting the data from the pilot signal, correlation of synchronization codes, and the BTS ID checking of Col. 3:25-28), wherein the cell-specific pilot subcarriers include information concerning a specific cell, a specific base station, or both (See Ma e.g., the cell-specific synchronization code uniquely associated with a BTS 3:19-21); inserting the generated cell-specific pilot subcarriers into predetermined frequency locations in a base station signal (See Ma e.g., the modulation of the cell-specific synchronization code onto the pilot channel carried by the predetermined pilot channel sub-carriers of the communication signal of Col. 8:35-46); generating common pilot subcarriers at the base station (See Ma e.g., the communication signal i.e., an OFDM signal / the access channel information with

common synchronization code of Col. 2:14-18, Col. 2:25-26, Figs. 8-9), for performing network operations (See Ma e.g., determination of synchronization parameters, sampling the received communication signals, correlation of extracted data with the common synchronization code of Col. 2:45-54), wherein the common pilot subcarriers include information common to at least multiple cells, base stations, or both (See Ma e.g., the common synchronization code associated with all transceivers in the communication network, the transmission of the communications signals to receivers of Col. 2:14-18); inserting the generated common pilot subcarriers into predetermined frequency locations in the base station signal (See Ma e.g., the mapping of common synchronization code onto the pilot channel of Col. 8:35-46); and transmitting the base station signal (See Ma e.g., the transmission of the communication signals from the BTS to receivers including the common synchronization code of Col. 2:14-18).

As per claims 2, 14, Ma teaches everything claimed as applied in the rejected claims 1, 13. In addition, Ma teaches wherein the common pilot subcarriers transmitted by different base stations are aligned in frequency index at transmission time (See Ma e.g., re-use of the pilot signals for frequency synchronization of Col. 9:4-9).

As per claims 9, 21, Ma teaches everything claimed as applied in the rejected claims 1, 13. In addition, Ma teaches wherein both the cell-specific and common pilot subcarriers are used jointly in a process based on information theoretic criteria (See Ma e.g., the access channel information with common synchronization code and cell-specific synchronization code of Col. 2:14-18, Col. 2:25-26, Figs. 1, 8-9).

As per claims 10, 16, 25, and 29, Ma teaches everything claimed as applied in

the rejected claims 1, 13, 23, and 26. In addition, Ma teaches wherein the network operations are frequency synchronization and channel estimation (See Ma e.g., the channel estimation, re-use of the pilot signals for frequency synchronization of Col. 8:62-64, Col. 9:4-9).

As per claim 11, Ma teaches everything claimed as applied in the rejected claim 1. In addition, Ma teaches wherein a microprocessor computes attributes of the pilot subcarriers, specified by their requirements, and inserts them into a frequency sequence contained in an electronic memory (See Ma e.g., the synchronization sub-carriers, broadcasting sub-carriers to reduce overhead, and the common sync carriers of Col. 6:21-31, Fig. 3).

As per claim 18, Ma teaches everything claimed as applied in the rejected claim 13. In addition, Ma teaches wherein signal power of the pilot subcarriers are controlled by adjusting their power individually or in subgroups comprising a plurality of pilot subcarriers (See Ma e.g., the BTSs functions i.e., amplification, modulation, demodulation etc of Col. 5:11-27).

As per claims 22, 24, and 28, Ma teaches everything claimed as applied in the rejected claims 13, 26. In addition, Ma teaches wherein the base station transmitted signals are received by a mobile station (See Ma e.g., the user terminal receiving the communication signals transmitted by the BTS of Col. 5:33-41, Fig. 1 elements 10-16).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Korpela (US Pub. No.: 2006/0245409 A1).

As per claim 12, Ma teaches everything claimed as applied in the rejected claim 1. In addition, Ma teaches wherein a set of base stations within the network transmit, along with both cell-specific pilot subcarriers and common pilot subcarriers (See Ma e.g., the communication signal i.e., an OFDM signal / the access channel information with common synchronization code and cell-specific synchronization code of Col. 2:14-18, Col. 2:25-26, Figs. 1, 8-9), cell-specific data subcarriers in which data information concerning a specific cell is embedded (See Ma e.g., modulation of the cell-specific synchronization code uniquely associated with a BTS onto a pilot channel, the predetermined pilot channel sub-carriers of the communication signal i.e., an OFDM signal of Col. 3:19-24) and common data subcarriers in which data information common to this set of cells in the network is embedded (See Ma e.g., the communication signal i.e., an OFDM signal / the access channel information with common synchronization code of Col. 2:14-18, Col. 2:25-26, Figs. 8-9). However, Ma is silent about wherein a receiver within the network determines channel coefficients based on cell-specific pilot subcarriers and applies the channel coefficients to cell-specific data subcarriers to compensate for channel effects and to recover cell-specific data information and determines composite channel coefficients based on common pilot subcarriers and

applies the composite channel coefficients to common data subcarriers to compensate for channel effects and to recover common data information.

In an analogous field of endeavor, Korpela teaches wherein a receiver within the network determines channel coefficients based on cell-specific pilot subcarriers (See Korpela e.g., the scrambling codes, the primary synchronization codes, secondary synchronization codes, and using the pilot signals to determine the channel coefficients of ¶ [0013]) and applies the channel coefficients to cell-specific data subcarriers to compensate for channel effects and to recover cell-specific data information (See Korpela e.g., comparing the received pilot signals and the known pilot signals, determining a complex channel coefficients, taking into account the changes in signals as they experience change in phase and amplitude of ¶ [0014]) and determines composite channel coefficients based on common pilot subcarriers (See Korpela e.g., determining a complex channel coefficients of ¶ [0014]) and applies the composite channel coefficients to common data subcarriers to compensate for channel effects and to recover common data information (See Korpela e.g., inferring value of the synchronization symbol by the mobile stations of ¶ [0020]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide above teachings of Korpela to Ma for the purpose of receiving the symbol sequence with correct channel coefficients reliably as suggested (See Korpela e.g., ¶ [0042]).

7. Claim 15, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Choi (US Pub. No.: 2005/0243774 A1).

As per claims 15, 27, Ma teaches wherein a frequency of the received base station signal is estimated using common pilot subcarriers of a same frequency index generated at a first and a second time (See Ma e.g., the re-use of timing synchronization and frequency synchronization, assigning pilot channel to sub-carriers with same indexes of Col. 8:62-66), provided that a time difference between the first and the second time is significantly shorter than a coherence period of communication channel (See Ma e.g., the timing synchronization and tracking frequency offset, reducing the communication overheads of Col. 8:35-46) and that a signal amplitude associated with the frequency index from a cell, generated at the first time, is a predetermined multiple of the signal amplitude associated with the frequency index from that cell, generated at the second time (the transmission of pilot signals from multiple of BTSs and the communication terminal obtaining several pairs of synchronization parameters including candidate timing position, FFT window position, and frame boundaries of Col. 14:50-63). However, Ma is silent about a phase associated with the same frequency index subcarrier from a cell, generated at the first time, is within +180° of the phase associated with the same frequency index subcarrier from that cell, generated at the second time.

In an analogous field of endeavor, Choi teaches a phase associated with the same frequency index subcarrier from a cell (See Choi e.g., spreading of values to various frequencies i.e., the frequency diversity and the reception of the values at the receiver with sufficient strength of ¶ [0019]), generated at the first time, is within +180° of the phase associated with the same frequency index subcarrier from that cell,

generated at the second time (See Choi e.g., phase difference between the path close to 180 degrees of ¶ [0019]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide above teachings of Choi to Ma for the purpose of receiving better multipath performance as suggested (See Choi e.g., ¶ [0018]).

8. Claim 17, 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Schmidl (US Pat. No.: 7,567,624 B1).

As per claim 17, Ma teaches everything claimed as applied in the rejected claim 13. However, Ma is silent about wherein phase diversity is achieved by adding a random phase to a subcarrier phase to prevent signal degradation, where the added phase is different for each cell, or wherein phase diversity is achieved by adding a random delay time duration, either in baseband or RF, to time-domain signals.

In an analogous field of endeavor, Schmidl teaches wherein phase diversity is achieved by adding a random phase to a subcarrier phase to prevent signal degradation (See Schmidl e.g., achieving full diversity by delaying signals from antennas to prevent paths from overlapping, adjusting the phases and amplitudes of Col. 2: 25-45), where the added phase is different for each cell, or wherein phase diversity is achieved by adding a random delay time duration, either in baseband or RF, to time-domain signals (See Schmidl e.g., providing a distinct delay associated with each derived version of the data signal and its respective antenna of Col. 2:46-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide above teachings of Schmidl to Ma for the purpose of optimizing signal reception as suggested (See Schmidl e.g., Col. 2:19-23).

As per claims 19, 20, Ma teaches everything claimed as applied to the rejected claim 13. In addition, Ma teaches wherein for frequency estimation common pilot subcarriers for each transmission branch are generated (See Ma e.g., the modulation of the cell-specific synchronization code onto the pilot channel carried by the predetermined pilot channel sub-carriers of the communication signal of Col. 8:35-46) such that there is a predetermined relationship between signal amplitude and phases of the pilot subcarriers of a particular frequency index at specified times (See Ma e.g., re-use of the pilot signals for frequency synchronization of Col. 9:4-9). Schmidl teaches wherein multiple antennas are used within an individual sector and multiple transmission branches are connected to different antennas (See Schmidl e.g., the multiple antennas, the antenna diversity, and the transmit antenna delays of Col. 2: 25-45, Fig. 2).

Allowable Subject Matter

9. Claims 3-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BABAR SARWAR whose telephone number is

(571)270-5584. The examiner can normally be reached on MONDAY TO FRIDAY 09:00 A.M -05:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NICK CORSARO can be reached on (571)272-7876. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BABAR SARWAR/
Examiner, Art Unit 2617

/KAMRAN AFSHAR/
Primary Examiner, Art Unit 2617